

# **Underwater Intelligent Sensor Protection System**

Peter J. Stein, Armen Bahlavouni

Scientific Solutions, Inc.

18 Clinton Drive

Hollis, NH 03049-6576

Phone: (603) 880-3784, Fax: (603) 598-1803, email: [pstein@mv.mv.com](mailto:pstein@mv.mv.com)

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## **LONG-TERM GOAL**

The long-term goal is to develop an Underwater Intelligent Sensor Protection System (UISPS) to keep underwater radiometers free of algae growth and other contaminants. UISPS will allow long-term autonomous radiometric measurements (in the order of one year), which are not currently possible.

## **OBJECTIVES**

The objectives of this program were the design and assembly of the prototype, perform preliminary testing in laboratory, debug the system as necessary, and perform testing in an ocean environment.

## **APPROACH**

This device consists of a spherical housing of which the lower portion houses the radiometer. The upper portion consists of an optical glass that completes the sphere. The composite sphere rotates within a circular aperture/scrapper which is in the immediate vicinity, but does not touch the sphere. The sphere and the scraper are attached to a cylindrical shell. As the sphere rotates past the scraper, the bulk of the contaminants are removed. Continuing the rotation, brings the optical window (and the rest of the sphere) into a cleaning solution and past a set of brushes and squeegees within the cylindrical shell. The cleaning cycle is complete when the sphere completes one full revolution and the optical glass reaches the 12 o'clock position again.

The frequency of cleaning, number of rotations per cleaning cycle, data sampling rate and frequency, and all other data acquisition and control parameters will be adjustable for greater flexibility of the device. A bi-axial inclinometer has also been implemented within the sphere to provide reference tilt data.

During long term testing, an unprotected radiometer adjacent to UISPS will be used to verify the contamination extent as well as data.

## **WORK COMPLETED**

A complete set of design drawings, machined components, and all other necessary mechanical hardware to assemble one prototype unit exist. The main computer for data acquisition and control has been purchased. An interface printed circuit board has also been designed and manufactured by SSI. A modified version of Satlantic OCI-200 seven wavelength radiometer housing was designed by SSI.

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and built by Satlantic. All electronic components necessary to populate this circuit board are also in house. During the year under review the circuit board designed at SSI have been populated. The circuit board and other sub assemblies of the UISPS were tested. Complete assembly and testing of the UISPS is in progress. The development of the software for the instrument is also in hand. The development and laboratory testing of the UISPS is expected to be completed by December, 1999. The UISPS unit will be deployed in the LEO site early next year for long-term field trials. An assembly drawing and some photographs are presented in the results section.

## **RESULTS**

The assembly drawing and photographs of the hardware are shown below.

## **IMPACT/APPLICATIONS**

This system will considerably enhance the quality of the underwater radiation measurements and reduce hardware maintenance costs by keeping the sensor clean and free of biological growth. Furthermore, the longevity of measurements will be greatly improved in comparison to current deployments.

## **TRANSITIONS**

A proposal has been submitted to ONR for completion of the Underwater ISPS and long-term field testing of the system.

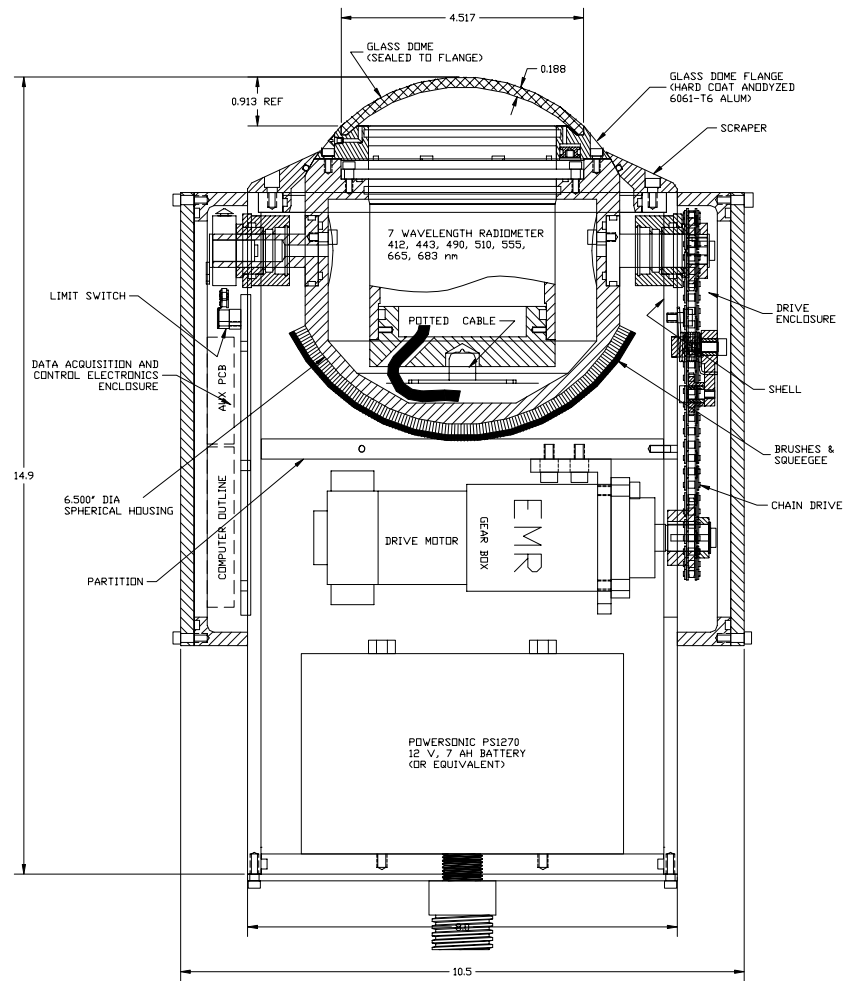
## **RELATED PROJECTS**

During the deployment phase of the SHEBA program in September 1997, SSI personnel deployed eight of the Arctic ISPS units in satellite sites as far as 50 Km from the main ice camp [1]. These units worked flawlessly for one full year, as intended. In October 1998, they were recovered, and one site re-deployed. Further information and deployment photographs are available on SSI's web page [1].

A marine version of the ISPS has also been development under ONR Contract #: N00014-95-C-0406. This version is intended to be integrated into the Navy's next generation meteorological sensor package.

## **REFERENCES**

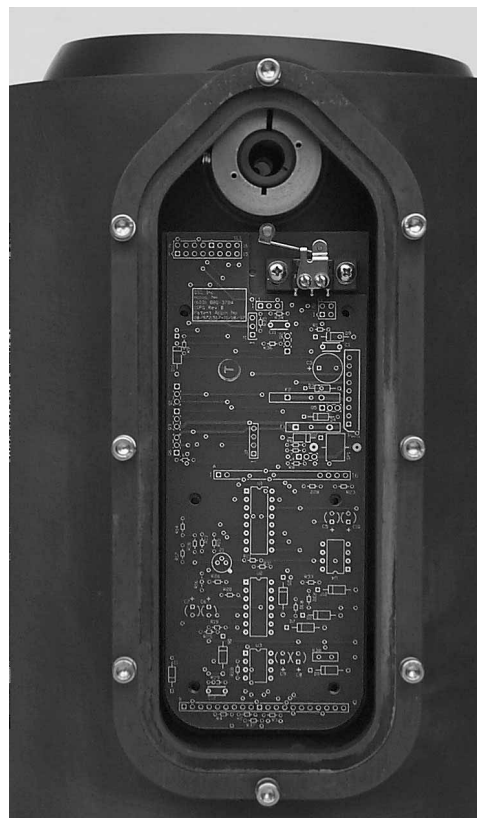
1. <http://www.ssilink.com>



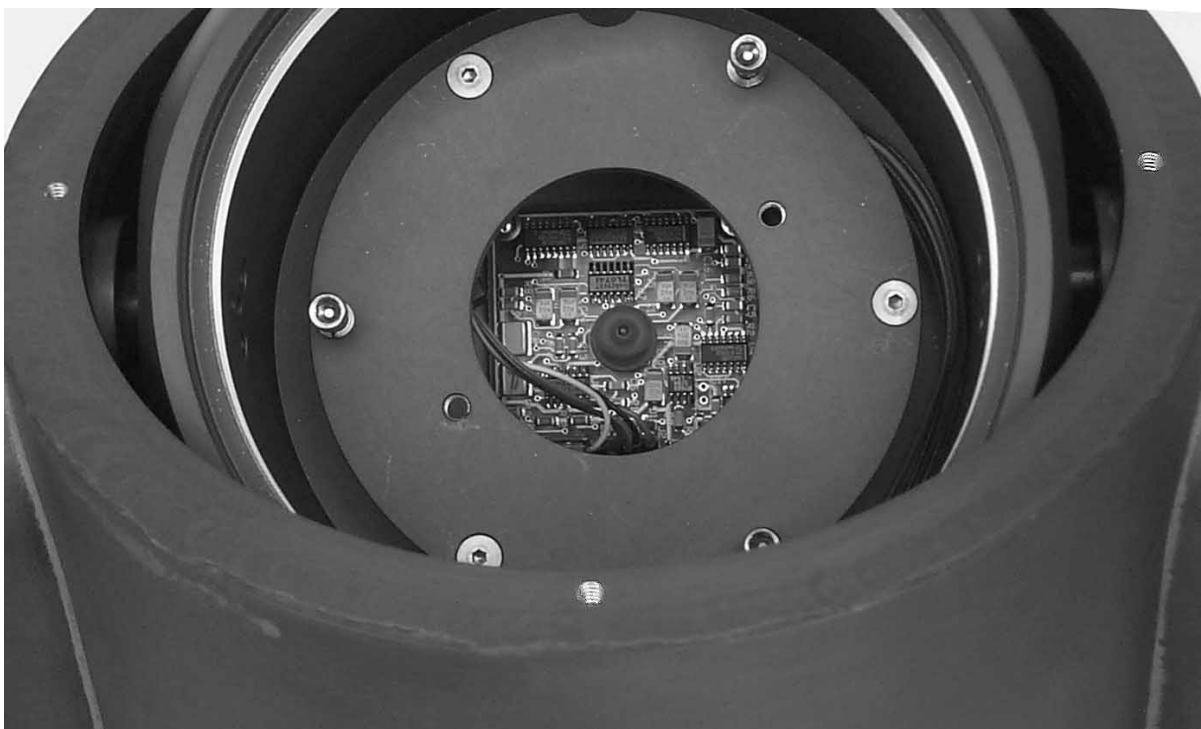
**Figure 1. UISPS Assembly Drawing**  
(Patent Number: 5,591,907 dated 1/7/97)



*Figure 2. Drive Enclosure*



*Figure 3. Electronics Enclosure*



*Figure 4. Bi-axial Inclinator*



*Figure 5. Scraper Ring*



*Figure 6. Optical Window*